

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of

The Establishment of Policies and
Service Rules for the Non-Geostationary
Satellite Orbit, Fixed Satellite Service
in the Ka Band

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IB Docket No. 02-19

REPLY COMMENTS OF TELEDESIC LLC

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SUMMARY

Teledesic is pleased that three of the five NGSO FSS system proponents who chose to submit comments on a Ka-band sharing regime agree that the Commission should adopt some version of its proposed Option III sharing model – “Avoidance of In-Line Interference Events.” These commenters agree that Option III is the most efficient method of accommodating all five Ka-band NGSO FSS applicants plus Teledesic. In addition, Option III is the option that best promotes the coordination negotiations that are and should be part of the efforts of all Ka-band licensees to launch and operate their systems without causing harmful interference to other operators.

Several of the second-round applicants fail to distinguish between coordination priority and coordination outcomes when analyzing the various sharing options. This distinction is crucial to understanding the practical effect of the Commission's four proposed sharing options. Although the outcome of coordination is never a foregone conclusion, the existence of coordination priority among future Ka-band NGSO FSS operators is. The need for clear priorities proceeds from the recognition that for coordination negotiations to be successful, operators must be required to seek coordination from all other operators with whom they could potentially interfere. The second-round applicants seem to believe that Teledesic's modification application has eliminated any need for attention to the issue of coordination priority. However, the fact is that coordination priority between Teledesic and the second-round applicants, and among the second-round applicants themselves, will remain an issue and will establish the procedural obligations of the parties as they negotiate coordination agreements.

When one considers the four proposed sharing options in light of the unavoidable issue of spectrum coordination, it is clear that the NPRM's third sharing option, Avoidance of In-Line Interference Events, will provide all operators with clear incentives to coordinate in good faith and thereby enjoy maximum flexibility to use all of the available spectrum without causing or receiving harmful interference. Contrary to the critiques of some second round applicants, Option III will not delay licensing, introduce undue coordination complexity, or require Commission micromanagement of the coordination process.

The other sharing options, band segmentation and homogeneous constellations, endorsed by @contact and Hughes respectively, are vastly inferior to an Avoidance of In-Line Events model. Hughes's proposal seems calculated to produce endless discussions that would most likely never lead to licenses, while @contact's proposal would produce quick but meaningless licenses that would most likely never lead to operational systems. Teledesic therefore urges the Commission to carefully consider its proposed rule to govern coordination procedures for NGSO FSS operations in the 20/30 GHz bands and to adopt the Avoidance of In-Line Interference Events model to promote spectrum sharing among Ka-band NGSO FSS systems.

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Teledesic submits these Reply Comments in response to comments submitted on April 3, 2002 on the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned proceeding.¹ Teledesic is pleased to note that three of the five NGSO FSS system proponents who commented agree that the Commission should adopt some version of its proposed Option III sharing model – "Avoidance of In-Line Interference Events." These commenters agree that Option III is the most efficient method of accommodating all five Ka-band NGSO FSS applicants plus Teledesic. In addition, Option III is the option that best promotes the coordination negotiations that are and should be part of the efforts of all Ka-band licensees to launch and operate their systems without causing harmful interference to other operators. Although comments submitted by @contact and Hughes endorse band segmentation and homogeneous constellations respectively, their rationales for Commission adoption of these alternatives do not survive even casual scrutiny. In particular, Hughes's proposal seems calculated to produce endless discussions that would most likely never lead to licenses, while @contact's proposal would produce quick but meaningless licenses that would most likely never lead to operational systems.

¹ Notice of Proposed Rulemaking, 17 F.C.C. Rcd. 2807 (rel. Feb. 6, 2002).

I. THE COMMENTS BETRAY CONSIDERABLE CONFUSION ABOUT THE CONCEPT OF COORDINATION PRIORITY.

Some of the comments from second-round applicants demonstrate that they either have failed to grasp or are intent on glossing over the critical distinction between coordination *priority* and coordination *outcomes*. This distinction must be observed in any sharing regime involving co-frequency operation. Although the second-round applicants would prefer to conflate the two concepts, they are in fact legally and factually distinct.

By establishing coordination priorities, it is possible to define clearly who has the responsibility for *initiating* coordination discussions. The need for clear priorities proceeds from the recognition that for coordination negotiations to be successful, operators must be required to seek coordination from all other operators with whom they could potentially interfere. Traditionally this has been accomplished by requiring each new entrant to request coordination from each incumbent operator. Besides being the traditional approach, this is also the most logical and the most efficient one, as it enables each operator to know in advance the systems with which it will have to coordinate.

Although the method of initiating coordination negotiations is always the same (*i.e.*, the new entrant requests coordination negotiations with the incumbent), the *outcome* of such negotiations is nonetheless far from a foregone conclusion, notwithstanding the operators' different coordination priorities. For example, an incumbent operator may be able to make some concessions but unable to make others. The new entrants' requests of the incumbent may be reasonable in some cases but unreasonable in others. The possible outcomes are limited only by human imagination and the specific facts of any particular case, but that is not to say the negotiations will begin without any baseline operating assumptions because the Commission has already adopted certain guidelines to structure the negotiations. In the

NPRM, the Commission framed its questions about burden sharing by noting (a) that “the second round licensees’ access to spectrum is subject to coordination with Teledesic,” i.e., Teledesic has *coordination priority* as a matter of law over second round systems; (b) that Teledesic must coordinate with second-round NGSO systems in good faith and exhibit *coordination flexibility* commensurate with its progress in the construction of its system; and (c) that no system will be expected to significantly alter its design once it has proceeded far along with implementation.² At bottom then, although Teledesic unquestionably retains coordination priority *vis-à-vis* second-round system proponents, that does not mean that each coordination negotiation will resolve all conflicts in favor of Teledesic, or that Teledesic need not make appropriate accommodations of second-round systems to facilitate sharing.

This distinction between *coordination priority* and *coordination outcomes* is critical to understanding the practical effect of the Commission's four proposed sharing options, because otherwise legitimate concerns about the fairness of *coordination outcomes* can lead to well-intentioned twaddle to the effect that no one has priority over anyone else. This is precisely the way to understand some of the second-round applicants’ comments on Teledesic's modification application. Notwithstanding the apparent baseline assumptions of the second-round commenters, the NPRM did not invite proposals on whether Teledesic’s January 2002 modification application changes the historical fact that Teledesic was licensed in the first round and that it, thus, retains a legal right to coordination priority. Rather, the Commission appropriately requested comment on how the five second-round applicants would be affected by the four sharing proposals included in the NPRM in light of the fact that their access to spectrum is subject to coordination with Teledesic, the only first-round licensee. Paragraph 14

² NPRM at ¶ 14.

of the NPRM makes clear that the proposals are to be evaluated not as a substitute for existing coordination rules, but as a supplement to them.

Importantly, coordination between licensees with different coordination priorities will be a part of the sharing regime regardless of which sharing option is selected *and regardless of what happens with respect to Teledesic's modification application*. In that entirely separate proceeding, Teledesic has demonstrated that its modified design will not increase harmful interference to any of the other proposed Ka-band NGSO FSS systems. If the Commission agrees, then it will grant the application and Teledesic will retain its coordination priority as the only first-round licensee. If, on the other hand, the Commission finds that Teledesic's modified constellation would cause an overall degradation of the interference environment, the Commission would treat the modification application as a new application – which would be too late for the second Ka-band NGSO FSS processing round. In this latter case Teledesic would be back at the drawing board, waiting for the Commission to finish the second round and begin a third (or perhaps to consider the application under the new processing rules adopted in the pending proceeding on licensing reform). If and when Teledesic received a new license, it would be required to coordinate with all of the second-round licensees, who would thus have coordination priority over Teledesic, and those licensees would be required to coordinate with Teledesic in good faith. Because the second round is closed as a matter of historical fact, these are the only two possibilities. Either way, the concept of priority is a critical element if licensees are to know in advance what is required of them.

As the Commission has noted, Teledesic's recently-filed modification application suggests that Teledesic has more coordination flexibility than it would if, for example, it had half its satellites in orbit already, but it does not under any circumstances place Teledesic on “equal

footing” with the five second round applicants with respect to coordination priority. Thus, the Commission’s adoption of a sharing regime should proceed in recognition of the inevitable necessity of coordinations between co-frequency operators without any substantive consideration of the merits of Teledesic’s modification application.

II. THE COMMISSION SHOULD ADOPT THE AVOIDANCE OF IN-LINE INTERFERENCE EVENTS MODEL SUPPORTED BY THREE OF THE FIVE PARTICIPATING NGSO FSS SYSTEM PROPONENTS.

With the exception of @contact and Hughes, all of the participating Ka-band NGSO FSS system proponents urge the Commission to adopt some version of the NPRM’s third sharing option, Avoidance of In-Line Interference Events.³ This approach is clearly superior to either of the band segmentation options or the homogeneous constellations option because it promotes spectrum coordination, allows the most flexibility for adapting to different licensing regimes, and most effectively prevents spectrum warehousing. Contrary to the misunderstandings of some of the commenters, reliance on Option III will neither complicate nor prolong the licensing process or the resolution of coordination negotiations. Instead, an Avoidance of In-Line Interference Events sharing regime will provide all operators with clear incentives to coordinate in good faith and thereby enjoy maximum flexibility to use all of the available spectrum without causing or receiving harmful interference.

A. Concerns About Successful Implementation of Option III Are Unfounded.

The critiques of the Avoidance of In-Line Interference Events sharing model offered by @contact and Hughes are threefold: 1) that this sharing method will delay the licensing of

³ Although TRW describes its proposal as a hybrid of Options III and IV, as explained in greater detail below, its proposal boils down to an Avoidance of In-Line Interference Events approach.

second-round systems; 2) that it will involve undue complexity; and 3) that it will require Commission micromanagement of all coordination negotiations. All three criticisms are absolutely without merit.

I. Timing

Although it is the only second-round applicant that raised this concern, @contact mistakenly believes that Option III would delay the conclusion of the second-round licensing process because the “In-Line Events [model] would first require the consideration and conclusion of time-consuming and complex coordination negotiations among all applicants (and potentially Teledesic) *before licensing*.”⁴ Indeed, @contact goes so far as to posit that “Operators would have no chance of meeting the ITU date if they were forced to await the outcome of all the proceedings and deliberations that would be required to develop an appropriate In-Line standard.”⁵ This is incorrect.

@contact never explains its reasons for assuming that Option III would inevitably delay second-round licensing, and Teledesic can see nothing in the NPRM that could have given @contact this idea. The NPRM does not provide that all coordination negotiations would need to be concluded prior to licensing and none of the other commenters have proposed this. Indeed, any casual observer of international licensing procedures, much less an aspiring NGSO FSS operator like @contact, must recognize that not all coordination issues can be resolved prior to licensing in light of the fact that satellites are operated internationally and must observe ITU coordination rules. Thus, an Avoidance of In-Line Events sharing model promises

⁴ @contact Comments at 13.

⁵ @contact Comments at 17.

licensing just as promptly as under Options I or II; only Option IV would require extended coordination discussions prior to licensing.

Rather than holding up licensing, an Avoidance of In-Line Interference Events sharing method will focus on the real-world issues associated with sharing between real systems rather than hypothesizing about the potential sharing challenges of paper ones. Although coordination negotiations could begin whenever system proponents choose, assuming all parties have a basic understanding of when in-line events are likely to occur, the design and construction process can proceed even if the actual coordination discussions are not concluded until the second operator is preparing for launch. At the same time, coordination discussions will not delay launch, because each operator will know in advance how to define an in-line event, and will understand that the default outcome in the absence of a comprehensive coordination agreement is frequency isolation for the duration of the in-line event.

2. Coordination Complexity

Both @contact and Hughes maintain that implementing Option III would involve undue complexity.⁶ Teledesic acknowledges that any NGSO coordination effort will involve a certain irreducible level of complexity because the service is by its very nature complex. However, each of the NGSO systems affected by inter-system sharing challenges in this band must be prepared to share internationally with non-U.S. systems and protect incumbent government users. Thus, sharing and ensuring the ability to avoid causing harmful interference to other users is an unavoidable part of launching and operating an NGSO FSS constellation at Ka band or in any band. Any system proponent who balks at this complexity is unlikely ever to launch a

⁶ See, e.g., @contact Comments at 16; Hughes Comments at 5.

system. Coordinating with other U.S.-licensed operators should thus be no more difficult than coordinating with non-U.S. operators or with U.S. government users.

Hughes premises its concerns about complexity on its perception that Option III imposes “unequal burdens” on “full mesh systems or other systems that rely on numerous small, earth stations communicating with each other” as compared with systems designed around gateway terminals.⁷ However, as Teledesic previously explained in its Ku-band Reply Comments in response to this very same concern of Hughes, this alleged disparity in treatment is illusory.⁸

With respect to satellite selection and spectrum usage, although users in a “full-mesh” system may not be in direct contact with a gateway, they are certainly controlled by some form of network control center via communication from the satellite. Given that in-line events are predictable, it is possible for the network control center to constrain the spectrum usage during an in-line event. With respect to the simultaneous handoff of a large number of users, networks with many users in a “full-mesh” configuration must have mechanisms in place for performing handoffs from one satellite to another. When a large city leaves the view of one satellite, all users in that city must be handed off to other satellites that are in view of the affected area and such action must be part of the normal system operation. Since in-line events are as predictable as normal satellite handoffs, the same mechanisms can be used to initiate handoffs due to in-line events.

⁷ Hughes Comments at 6.

⁸ See Teledesic Reply Comments, IB Docket No. 01-96, at 4 (filed Aug. 6, 2001).

3. Commission Involvement

@contact contends that “imposing avoidance of In-Line Events could also unnecessarily involve constant regulatory entanglement in the coordination process.”⁹ This contention, like @contact’s earlier argument about licensing delays, is largely unexplained. Although Teledesic agrees that Commission involvement in the coordination process should be kept to a minimum, it is not clear why @contact believes Option III will require any more Commission involvement than Options I or II. In any of these cases, the Commission’s role will be limited to establishing (1) a clear procedure for coordination; and (2) a default outcome to take effect in case of impasse. The only additional Commission decision required under Option III is a definition of in-line events, but that, as demonstrated by the comments of Teledesic and Skybridge which have grown out of the Ku-band sharing rulemaking, is already well advanced and can easily be finalized quickly. Once this general definition is written into the service rules, the Commission need not have further involvement. Teledesic includes a proposed rule in Attachment A to these Reply Comments to assist the Commission in these tasks. The Commission would certainly not need to run extensive simulations itself in order to define the relevant avoidance angles, any more than the Commission is required to intervene, e.g., in satellite earth station coordinations with terrestrial licensees by running “official” interference analyses. In short, Option III is at least as good as Options I and II in this respect.

⁹ @contact Comments at 16.

B. All Ka-Band NGSO FSS Operators Will Be Able to Implement Their Systems in Reliance on the Option III Sharing Model With Relative Ease and Assurance of Continued Flexibility Over Time.

Teledesic is confident that the Avoidance of In-Line Interference Events model could be implemented with relative ease in the Ka band, particularly in light of the extensive study of this sharing method for NGSO FSS networks that has taken place in the context of the Ku-band sharing rulemaking. Indeed, the very fact that Teledesic and Skybridge set forth very detailed, albeit in some cases technically distinct proposals for implementing Option III, demonstrates that Commission involvement can be limited to selecting fundamental baseline assumptions about how coordination negotiations should proceed and then allowing the operators to conclude coordination agreements independently.

I. Definition of In-Line Events

Skybridge and Teledesic have proposed different definitions of in-line events but Teledesic is confident that with minimal consideration the Commission can resolve this issue. Teledesic believes that defining in-line events by reference to ITU-R Recommendation S.1323-I would offer a useful means of establishing a baseline measure of acceptable interference between two or more systems. Based on this methodology, an in-line interference event between two NGSO FSS networks can be defined using minimum angular separations between links of the two systems. Such minimum angular separations are those that guarantee that interference is not responsible for more than a) 10% of the time allowance for the BER specified in the short term performance objectives of either network; or b) a 10% decrease in the amount of reserve capacity available to links that require heavier coding to compensate for rain fading in either network, as applicable.¹⁰

¹⁰ See Attachment A.

Teledesic disagrees with Skybridge's proposal to utilize a definition that instead relies on using the interference level corresponding to synchronization loss as a coordination threshold.¹¹ Skybridge's assertion that an in-line interference event definition based on synch-loss is less complicated than a definition based on S.1323-I is unpersuasive. As Skybridge's own comments note, the steps associated with determining angular separations associated with a coordination threshold based on synch-loss also require extensive simulations. Although Teledesic regards the two methodologies as equally straightforward, and clearly within the capabilities of any company that can actually launch an NGSO FSS network, Teledesic urges the Commission to adopt a definition based on S.1323-I, which even Skybridge acknowledges will yield results that are "indisputably the most accurate."¹² But in the end, a satisfactory definition can probably be crafted using either approach.

TRW's proposal to define in-line events based on a five-degree angular separation¹³ is anything but compelling when one considers that later on the same page, TRW notes that "required topocentric LOS angular separation depends on the system parameters."¹⁴ Teledesic believes an effort to fix angular separation for all Ka-band systems will unduly complicate the coordination effort, and that instead angles should be established in bilateral coordination discussions based on Recommendation ITU-R S.1323-I.

2. Apportioning Interference Allowance

In its initial comments, Teledesic proposed that the Ka-band services rules include provisions to scale the aggregate interference allowance in order to account for multiple

¹¹ Skybridge Comments at 14.

¹² *Id.* at n.37.

¹³ TRW Comments at 6.

¹⁴ *Id.*

interference sources. Based on current ITU-R studies, there is evidence that even for the small percentage of time associated with the short-term BER requirement, there is interference aggregation both in time and power. It is, however, always possible to express the single entry requirement as a percentage of the time allowance for the BER specified in the short-term objectives (or as a percentage of the reserve capacity for systems employing adaptive coding). Thus, where only two systems are operational, a 10% allowance suffices. Although conclusive ITU studies have not yet resolved how conservatively the allowances should be set when three or four systems are operational, Teledesic proposes a 7% allowance when three systems are involved (two interfering sources) and a 5% allowance when four or more systems are involved (three or more interfering sources).

As Skybridge appears to recognize, its alternative proposal to use a 7% allowance for unavailability increase no matter how many systems are in operation¹⁵ is overly conservative when only two systems are in operation. Such an approach leads to the identification of alleged “in-line events” that do not in fact inhibit the operations of either system. However, Skybridge suggests that over-constraining the first two systems is better than having to revisit sharing arrangements between those systems once a third is launched. This rather Procrustean proposal is somewhat like proposing to pay 50% more for gasoline now because inflation will eventually increase the price anyway. Certainly, the launch of a third NGSO FSS network will be a significant inconvenience for the first two systems, but that does not seem to justify establishing a more onerous sharing regime any earlier than necessary. Moreover, the 7% figure has not been adequately verified even in the three-system environment. This makes it particularly inappropriate to impose it now when it is clearly not yet needed.

¹⁵ Skybridge Comments at 16-17.

C. Text for a Rule Implementing Option III is Straightforward.

As Teledesic noted in its comments on the Ku-band NGSO FSS sharing NPRM, it is difficult to provide helpful comments about a proposed technical rule when the rule is merely described in general terms in the NPRM without being attached.¹⁶ The widely disparate ways in which the commenters in this proceeding have interpreted the options in the NPRM emphatically confirm this observation. Obviously, the Commission cannot really adopt “Option III” or any other option until it adopts a *rule* (i.e. written text) implementing that option. In the interest of moving that process along, Teledesic is pleased to include as Attachment A to these Reply Comments some proposed rule text for the Commission’s consideration.

Stripped of the boilerplate needed for Federal Register publication, the new rule would read as follows:

Section 25.2xx Coordination Procedures for NGSO FSS Operations in the 20/30 GHz Bands.

- (a) *Coordination Requirement.* Before transmitting from any earth station or space station in the 28.6-29.1 GHz or 18.8-19.3 GHz bands for the first time, each NGSO FSS licensee shall effect coordination with each previously licensed NGSO FSS operator in these bands. In the case of two operators whose licenses were granted on the same day, the responsibility for initiating coordination shall rest with the licensee whose first satellite was launched later. Coordination may be effected using information relating to the space stations and the parameters of one or more typical earth stations. All parties are required to coordinate in good faith, and the Commission may, in response to a petition from a participant, assess forfeitures for dilatory tactics.

¹⁶ Comments of Teledesic LLC at In.2, IB Docket No. 01-96 (filed July 5, 2001). Teledesic’s initial comments in the instant proceeding also noted a number of ambiguities in the way that some of the four options were described, particularly Options II and IV. E.g., Teledesic Comments at 8-9 & 13. Contrary to the bizarre interpretation advanced in @contact’s comments at n.34, Teledesic has never suggested that the adoption of a rule requires two separate rulemakings. Teledesic has merely noted what is probably obvious to everyone with the apparent exception of @contact: that a rulemaking is not over until there is a rule.

- (b) *Definition of "In-Line Events."* For purposes of the coordinations required by this section, an "in-line event" is defined as the occurrence of any physical alignment of space and/or earth stations of two satellite networks in such a way that the angular separation between operational links of the two networks is less than the minimum angular separation required to guarantee that interference is not responsible for more than 10% of the time allowance for the BER specified in the short term performance objectives of either network, or more than a 10% decrease in the amount of reserve capacity available to links that require heavier coding to compensate for rain fading in either network, as applicable. (See Recommendation ITU-R S.1323-1.) If three satellite networks are in co-frequency operation, the coordination threshold shall be 7% rather than 10%, and if four or more satellite networks are in co-frequency operation, the coordination threshold shall be 5%.
- (c) *Request for Coordination and Exchange of Information.*
- (1) The party responsible for initiating coordination may do so by delivering a request to the licensee from whom coordination is being requested. The request for coordination shall contain whatever supporting technical information the requesting operator deems necessary for the coordination.
 - (2) Each NGSO FSS operator that receives a request for coordination shall, within 30 days of receipt, respond to the request with technical information that corresponds to the information provided by the requesting operator and be available to participate in coordination meetings.
- (d) *Preliminary Agreement on Avoidance Angles Defining In-Line Events.* The first step in each coordination is for the coordinating operators to agree on the universe of in-line events (expressed in terms of the avoidance angles to be used). If the parties are unable for any reason to reach this agreement on their own before the 120th day following the request for coordination, any party to the coordination may insist on binding arbitration under the rules of the American Arbitration Association, to be concluded within an additional 90 days. Either the parties' agreement regarding the avoidance angles to be used, or in the absence of an agreement the results of binding arbitration, shall be communicated to the Commission.
- (e) *Conclusion of Coordination.* Once the relevant avoidance angles have been determined in accordance with paragraph (d), the parties shall work diligently and in good faith toward a comprehensive agreement on any mitigation techniques that will be employed by one or more operators. Coordination shall be considered to have been effected as soon as (1) the parties reach a comprehensive agreement resolving all in-line events that have been identified and jointly inform the Commission that coordination has been concluded; or (2) the parties jointly inform the Commission that they are at an impasse regarding some or all in-line events and have elected to invoke the default sharing solution

of paragraph (f) for the in-line events as to which there is an impasse. Notwithstanding any declaration of impasse, NGSO FSS operators shall remain free to revisit any issue bilaterally and successfully conclude comprehensive sharing arrangements at any time.

- (f) *Default Sharing Solution.* If the parties reach an impasse and invoke the default sharing solution pursuant to paragraph (e), they must divide the assigned uplink and downlink spectrum equally between them for the duration of any unresolved in-line events. Priority in selecting spectrum segments belongs to the operator with coordination priority under paragraph (a).

Other parties will surely suggest changes to the particulars of this proposed rule, and in the end the rule that is adopted will no doubt be better for the additional consideration their contributions occasion. Even in its current form, however, the rule clearly refutes some of the criticisms that have been rather casually aimed at Option III. For example,

- Option III can be implemented without delaying licensing in any way;
- Option III can be implemented with a rule that is significantly less complex than, for example, the existing rules that define and limit equivalent power flux-densities for NGSO FSS systems,¹⁷ or several rules governing “Little LEO” operations;¹⁸ and
- Option III can be implemented in a way that requires no Commission involvement whatsoever.

The Commission and the interested parties can therefore push these objections aside and turn to the business of refining the proposed rule text. Teledesic looks forward to the constructive engagement of all parties in that endeavor.

¹⁷ 47 C.F.R. §§ 25.201 & 25.208(i).

¹⁸ 47 C.F.R. §§ 25.259 & 25.260.

III. EACH OF THE ALTERNATIVE SHARING METHODOLOGIES CONTAINS SERIOUS FLAWS THAT WOULD UNNECESSARILY AND UNDULY RESTRICT USE OF THE AVAILABLE SPECTRUM.

A. The Hughes Version of “Homogeneous Constellations” Would Produce No NGSO Constellations At All.

Although Hughes claims to be supporting Option IV, what Hughes is actually proposing seems less like the NPRM’s version of Option IV and more like our old friend the negotiated rulemaking. The NPRM describes a “homogeneous constellations model” wherein the Commission would adopt a homogeneous constellation standard and require all (or possibly just some) licensees to adhere to it. By contrast, the Hughes proposal would rely upon the second-round applicants and Teledesic to agree *without Commission involvement* on a method of coordinating both the design and operation of their constellations. This proposal should be dismissed for at least three reasons.

First, Hughes presupposes a consensus among all operators. Teledesic certainly agrees that coordinations should be conducted with minimal Commission involvement, but the fact is the second-round applicants held meetings aimed at achieving precisely this type of consensus for several years prior to the release of the NPRM, without any appreciable success. Neither Hughes nor any other second-round applicant has demonstrated a willingness to consider the sort of fundamental design changes that would be required to make homogeneous constellations possible. If the second-round applicants want to sink back into the same pointless discussions, then in a way it is none of Teledesic’s business, but it seems to be rather bad public policy.

Second, Hughes would delay the distribution of second-round licenses until all the second-rounders agreed on a homogenized constellation.¹⁹ Given the urgency noted by the other second-rounders about meeting ITU deadlines, Hughes's willingness to delay the licensing process further at this late date is remarkable, as it would very likely make it impossible for any of the second-rounders – including Hughes – to retain their ITU priority. If a half-hearted NGSO FSS applicant wanted to make a “Trojan horse” proposal that would essentially doom all of the second-round applications, it is difficult indeed to think of a proposal that would undermine the service as effectively as Hughes's.

Third, while Hughes's “consensus-based” version of Option IV introduces a number of difficulties that were not present in the Commission's version, it unfortunately shares many of the problems that were already there. Teledesic noted in its initial comments that U.S.-only homogeneity would have extremely undesirable implications for sharing with non-U.S. systems. Although domestic homogeneity would resolve the challenges associated with co-frequency sharing among the current class of U.S. Ka-band NGSO FSS proponents, the fact remains that, upon launch, these U.S. systems will also be obligated and yet unprepared to share with non-homogeneous foreign operators. Moreover, in a more general sense, forcing homogeneity among the currently affected parties may also be a short-sighted because it will stifle future

¹⁹ Hughes Comments at 10-11 (“[I]f the Commission decides to implement this option, in one form or another, the Commission must, as it has done in the past, provide all Ka-band NGSO FSS applicants the opportunity to amend their applications to take into account the constellation type or types selected by the Commission under its modified service rules. This would be done after the applicants have completed negotiations on the details of the homogeneous constellation parameters.”).

innovation.²⁰ To the extent that narrow operating parameters are established at this early stage of the development of NGSO FSS service, little or no incentive will exist to improve upon the current architectures in the future, either by new entrants or incumbent operators as they replace their first generation of satellites. As is always the case under such circumstances, the primary loser when innovation is stifled is the consumer.

B. The TRW “Hybrid” Proposal Is Basically Option III.

TRW tries very hard to position itself as less than a full-fledged supporter of Option III, but ultimately its “hybrid” proposal is basically Option III. Indeed, the key feature by which TRW distinguishes its proposal is the “addition” of frequency isolation in the event that satellite diversity is not utilized.²¹ TRW apparently has not recognized that frequency isolation is by definition the default outcome under the Commission’s proposal.²²

What actually distinguishes TRW’s “hybrid” from the version of Option III set forth in the NPRM seems to be the introduction of an ill-defined but apparently not-quite-purely-advisory role for the Commission. TRW wants the Commission to establish “system parameters that applicants must identify in order to facilitate coordination.”²³ TRW vacillates as to whether the Commission should “establish” system parameters for optimization or

²⁰ See Skybridge Comments at 10. (“[T]he selection of a required constellation design would constrain operators toward certain classes of services, for which the chosen constellation is optimized. As a result, the operators may not be able to bring to the market innovative services that depend on features not incorporated into the chosen architecture”).

²¹ TRW Comments at 4.

²² See NPRM at ¶ 28 (“If operators cannot reach a coordination agreement with a new entrant, they would be required to establish an in-line event spectrum sharing procedure based on the frequency isolation technique, that is, segmenting the spectrum among the operating systems involved in the predicted specific in-line interference event.”).

²³ TRW Comments at 4, 6.

“formally encourage” the parties to do so.²⁴ Either way, TRW is inviting significant delay by seeking to embroil all of the future operators (and possibly the Commission) in a challenging and unnecessary effort to coordinate all six potential constellations before any are launched when virtually everyone agrees that the launch of all six is most unlikely. TRW’s demand that “all NGSO FSS applicants should be made to develop a common set of parameters, i.e., uplink e.i.r.p density, downlink power flux density, satellite antenna roll-off, etc. that will enable a stable, common environment to be established,”²⁵ is a reasonable assessment of how the various proponents should begin their coordination discussions, but the proposal to force the Commission to come up with an officially sanctioned list before the information is exchanged can only delay real progress. It is at first blush surprising to see such a proposal from TRW, which on many occasions shows such keen awareness of ITU deadlines for implementing these systems. The proposal is, however, less surprising when one reads further in TRW’s comments that the company regards its upcoming ITU milestones as “unrealistic” and seeks Commission intervention to extend those obligations by refiling the ITU registrations.²⁶ Unless the Commission settles on this course of refiling the ITU notifications, TRW’s proposal to delay coordination under Option III until after a set of common parameters receives official endorsement would be extremely detrimental to second-round systems.²⁷

²⁴ *Id.* at 4, 6.

²⁵ *Id.* at 6.

²⁶ *Id.* at 17.

²⁷ Obviously, this part of TRW’s prescription would be completely untenable unless TRW’s “hybrid” were restricted to apply only to second-round applicants and not to Teledesic. Any refiling for second-round applicants would place second-round licensees so far down in the list of ITU coordination priorities as to be doomed to failure unless Teledesic were free to move ahead with the implementation of LEOSAT-I, and even in this latter case their international coordination burden would become much heavier.

C. The @contact Proposal: Band Segmentation

@contact, the sole supporter of either of the band segmentation sharing options proposed by the Commission, is firmly convinced that “unlike all other proposals,” band segmentation will allow the Commission to immediately issue second-round licenses.²⁸ However, as previously explained, none of the first three sharing options require or contemplate any delay in licensing; only the adoption of Option IV would jeopardize the speedy conclusion of the second-round licensing process. Although its mistaken impression that its only chance for immediate licensing resides in the selection of band segmentation dominates its comments, @contact offers several other equally unconvincing arguments in support of this sharing method.

According to @contact, band segmentation will provide Ka-band NGSO FSS operators with “guaranteed capacity and the regulatory certainty they need to proceed with the construction and launch of their services.”²⁹ However, an Avoidance of In-Line Interference Events model unquestionably provides both more capacity and greater certainty with regard to both initial and long-term implementation of a Ka-band NGSO FSS constellation than band segmentation. For example, were the Commission to segment the band, @contact would acquire access to a 1/*n*th of the available Ka-band spectrum. Although that would appear to provide some “certainty,” the amount of spectrum is so small that if it were the only available spectrum each operator would face certain doom. The fact is that until coordination negotiations are complete, @contact will not know whether it will ever acquire the right to use the rest of the available spectrum and will have to proceed to construct its constellation

²⁸ @contact Comments at 12.

²⁹ @contact Comments at ii; see also *id.* at 12.

without prior knowledge of the outcome of those negotiations. By contrast, under Option III, all of the second-round applicants and Teledesic will know that they will have access to 2 x 500 MHz almost all of the time. By any measure, this latter scenario provides greater certainty and capacity to @contact and all of the other Ka-band NGSO FSS system proponents.

@contact's support for such a minimal guarantee of capacity is rooted in its apparent belief that "the spectrum needs of the applicants will likely be 'modest' initially."³⁰ Although @contact's expected spectrum needs may well be modest, Teledesic sees no reason to needlessly constrain the flexibility of other NGSO FSS operators – and their customers – to a narrow segment of the available spectrum when in reality, even in a worst-case scenario, frequency isolation under Option III would only be required (at most) during in-line interference events. Moreover, even if 1/nth of the spectrum is somehow "enough" for @contact, Teledesic has explained that the 1/nth of the 2 x 500 MHz in which each system would have priority may not correspond to the way the spectrum is actually used by any particular system.³¹ @contact certainly does not explain how its own design will accommodate "priority" bandwidths that might start at 250 MHz but then become 167.67 MHz, then 125 MHz, then 100 MHz, then a puny 83.33 MHz. Nonetheless, were @contact's proposal adopted, preparing for such contingencies would be necessary given that the default outcome would be a decreasing availability of spectrum as additional NGSO FSS systems are launched and begin to operate.

The fact that the Commission relied upon band segmentation in the 2 GHz MSS proceeding and found it equally applicable to both NGSO and GSO systems does not mean

³⁰ @contact Comments at 2.

³¹ Teledesic Comments at 6.

that this sharing method is appropriate in this case, as @contact suggests in its comments.³² Indeed, frequency sharing was simply not an option for 2 GHz MSS operators (either GSO or NGSO) because of the very nature of that service (involving non-directional antennas in earth and space stations). By contrast, cofrequency sharing can work for FSS operators and can be achieved either through coordination agreements or through the default outcome associated with Option III. @contact's proposal would thus needlessly constrain Ka-band NGSO FSS operators when in-line events can be managed with much less draconian measures.

Finally, @contact incorrectly asserts that "segmentation provides licensees with equal access to spectrum outside of U.S. borders, consistent with spectrum allocations in other countries."³³ This is, simply put, absurd. Indeed, reliance on @contact's oversimplified characterization of the various requirements for the operation of Ka-band NGSO FSS systems in foreign countries would offer the FCC no hope of providing operational systems with the flexibility to tailor their operations to differing international spectrum requirements.³⁴ NGSO FSS systems need maximum flexibility to accommodate locally varying band plans and licensing regimes. All systems must have the agility to operate over the full 2 x 500 MHz. Requiring them to utilize a segmented portion of the band in the U.S. would unduly complicate their international operations. Indeed, in the NPRM the Commission explicitly acknowledged its concerns about the implications of various decisions of the European Radiocommunication Committee ("ERC") which "may have a significant impact on the commercial viability of the

³² *Amendment of the Commission's Space Station Licensing Rules and Policies*, Notice of Proposed Rulemaking, 17 F.C.C. Rcd. 3847 at ¶ 47 (rel. Feb. 28, 2002).

³³ @contact Comments at 11.

³⁴ NPRM at ¶ 17.

proposed NGSO FSS systems.”³⁵ These decisions clearly demonstrate the importance of ensuring that U.S. NGSO FSS systems have the flexibility of access to the full 2 x 500 MHz of spectrum contemplated under Option III. (They also demonstrate that @contact is wrong to assert that all NGSO FSS spectrum is fungible – clearly, being able to operate in Europe is better than not being able to operate in Europe.) And the ERC Decisions are only one example.

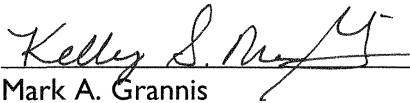
Although it is tempting to continue, suffice it to say that Teledesic can find no reason that band segmentation would be attractive to @contact or any other future NGSO FSS operator. The make-believe quality of @contact’s arguments is well captured in its logically flawed suggestion that band segmentation would expedite the licensing process and in turn provide second-round applicants an incentive “to engage in the time consuming and costly process of developing a *real-world* sharing agreement.”³⁶ Teledesic finds it surprising that any licensee that seeks to bring its system into operation would need any additional incentive to seek successful coordination. Thus, Teledesic can only conclude that @contact is more concerned about acquiring a stake in some quantifiable amount of spectrum than it is in actually operating a successful Ka-band NGSO FSS system. One can only speculate as to why a specific band segment would be valuable to someone who did not intend to use it.

³⁵ *Id.*

³⁶ @contact Comments at 11.

CONCLUSION

For the foregoing reasons, Teledesic urges the Commission to adopt the proposed rule in Attachment A, implementing an Avoidance of In-Line Interference Events model for spectrum sharing among Ka-band NGSO FSS systems.

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April 18, 2002

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Attachment A

Proposed Rule Changes

PART 25 – SATELLITE COMMUNICATIONS

1. The authority citation for part 25 continues to read as follows:

AUTHORITY: 47 U.S.C. 701-744. Interprets or applies sec. 303, 47 U.S.C. 303. 47 U.S.C. sections 154, 301, 302, 303, 307, 309 and 332, unless otherwise noted.

2. Subpart D is amended by adding a new section 25.2xx to read as follows:

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Section 25.2xx Coordination Procedures for NGSO FSS Operations in the 20/30 GHz Bands.

(a) *Coordination Requirement.* Before transmitting from any earth station or space station in the 28.6-29.1 GHz or 18.8-19.3 GHz bands for the first time, each NGSO FSS licensee shall effect coordination with each previously licensed NGSO FSS operator in these bands. In the case of two operators whose licenses were granted on the same day, the responsibility for initiating coordination shall rest with the licensee whose first satellite was launched later. Coordination may be effected using information relating to the space stations and the parameters of one or more typical earth stations. All parties are required to coordinate in good faith.

(b) *Definition of "In-Line Events."* For purposes of the coordinations required by this section, an "in-line event" is defined as the occurrence of any physical alignment of space and/or earth stations of two satellite networks in such a way that the angular separation between operational links of the two networks is less than the minimum angular separation required to guarantee that interference is not responsible for more than 10% of the time allowance for the BER specified in the short term performance objectives of either network, or more than a 10% decrease in the amount of reserve capacity available to links that require heavier coding to compensate for rain fading in either network, as applicable. (See Recommendation ITU-R S.1323-1.) If three satellite networks are in co-frequency operation, the coordination threshold shall be 7% rather than 10%, and if four or more satellite networks are in co-frequency operation, the coordination threshold shall be 5%.

(c) *Request for Coordination and Exchange of Information.*

(1) The party responsible for initiating coordination may do so by delivering a request to the licensee from whom coordination is being requested. The request for coordination shall contain whatever supporting technical information the requesting operator deems necessary for the coordination.

(2) Each NGSO FSS operator that receives a request for coordination shall, within 30 days of receipt, respond to the request with technical information that corresponds to the information provided by the requesting operator and be available to participate in coordination meetings.

(d) *Preliminary Agreement on Avoidance Angles Defining In-Line Events.* The first step in each coordination is for the coordinating operators to agree on the universe of in-line events (expressed in terms of the avoidance angles to be used). If the parties are unable for any reason to reach this agreement on their own before the 120th day following the request for coordination, any party to the coordination may insist on binding arbitration pursuant to the rules of the American Arbitration Association, to be concluded within an additional 90 days. Either the parties' agreement regarding the avoidance angles to be used, or in the absence of an agreement the results of binding arbitration, shall be communicated to the Commission.

(e) *Conclusion of Coordination.* Once the relevant avoidance angles have been determined in accordance with paragraph (d), the parties shall work diligently and in good faith toward a comprehensive agreement on any mitigation techniques that will be employed by one or more operators. Coordination shall be considered to have been effected as soon as (1) the parties reach a comprehensive agreement resolving all in-line events that have been identified and jointly inform the Commission that coordination has been concluded; or (2) the parties jointly inform the Commission that they are at an impasse regarding some or all in-line events and have elected to invoke the default sharing solution of paragraph (f) for the in-line events as to which there is an impasse. Notwithstanding any declaration of impasse, NGSO FSS operators shall remain free to revisit any issue bilaterally and successfully conclude comprehensive sharing arrangements at any time.

(f) *Default Sharing Solution.* If the parties reach an impasse and invoke the default sharing solution pursuant to paragraph (e), they must divide the assigned uplink and downlink spectrum equally between them for the duration of any unresolved in-line events. Priority in selecting spectrum segments belongs to the operator with coordination priority under paragraph (a).

CERTIFICATE OF SERVICE

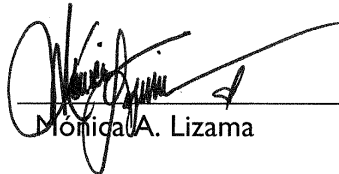
I, Mónica A. Lizama, do hereby certify that copies of the foregoing Reply Comments of Teledesic LLC have been sent by first class mail on this 18th day of April 2002, to the following:

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